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COMPARATIVE COSTS OF PRODUCING PLANTS IN A 200 ACRE FIELD NURSERY IN OHIO DIFFERENTIATED BY SPECIES OF PLANT

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ABSTRACT

The objective of this paper is to compare the costs of producing "balled and burlapped" field grown plants in Ohio differentiated by species of plant. Total annual costs per salable plant in a 200 acre nursery by species were $9.39 for 18-24" slow growing evergreens (Taxus), $7.09 for 18-24" fast growing evergreens (Juniperus), $7.07 for 3-4' tall deciduous shrubs (Viburnum), $35.61 for 2" caliper shade trees (Acer rubrum), $24.73 for 1 1/2" caliper ornamental trees (Malus), and averaged $12.43 for all species. Fixed costs averaged 39% and variable costs 61% of the total.

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INTRODUCTION

To make more informed decisions as to whether to enter, leave, or expand field production, nurserymen require production,marketing and financial information. Comprehensive cost model have recently been developed for container grown crops in U.S.D.A. Plant Hardiness Zone 6 (3), for field grown crops in U.S.D.A Plant Hardiness Zones 7 and 8 (1), and for field grown crops in U.S.D.A. Plant Hardiness Zones 5 and 6 (2). This paper summarizes per salable plant costs of producing nursery products in a 200 acre field nursery.

MATERIALS AND METHODS

A model firm was synthesized using the conceptual framework of economic engineering wherein the "best proven practice" was included for the model. The complete model included developing an appropriate production cycle (Table 1); schematic drawings of the physical layout, including buildings and irrigation system; lists of equipment and other items; a complete sequence by month and year of nursery operational steps beginning with land preparation and ending with loading the finished product for wholesale distribution; and budgets for fixed and variable costs (2). Commonly grown nursery stock were divided into five cultural groups: slow growing evergreens, fast growing evergreens, deciduous shrubs, shade trees, and ornamental trees. While not all inclusive, the groups do permit a range of per unit costs to be developed as they relate to input costs and cultural

factors. One species of plant was chosen to represent each cultural group. The production system provided for propagating shrubs (Taxus, Juniperus, and Viburnum) and for purchasing liners for trees (Acer rubrum and Malus).

Data for this study were obtained from wholesale nurseries and nursery suppliers in Ohio during the late Autumn and Winter of 1984 and the Spring of 1985. Price quotations obtained were for the 1985 production season. The basic goals in synthesizing production facilities were to minimize labor expenses, flow and movement of plant material and equipment, maximize the number of salable plants and allow future expansion. The nursery reported on consisted of 200 acres with 175 acres being growing space and 25 acres production facilities, holding area, field bed area and roads. Twenty percent of the growing space was assigned to each of the cultural groups.

Costs were established for all factors of production including management and invested capital. Since most nurseries use cash rather than accrual procedures, the analyses were completed on a "cash" basis. Capital requirements for establishing the nursery were first determined. Second, physical factors associated with the nursery and annual shipment requirements were established. Third production systems for the enterprises budgeted were described. Fourth, annual fixed costs were calculated. Fifth, estimated variable costs for each of the five groupings of plants were determined. Sixth, summaries were made of fixed and variable costs for each cultural group (Tables

2 and 3).

RESULTS AND DISCUSSION

Annual fixed costs associated with capital investment (depreciation, interest, insurance and taxes) were $270,110. An additional $163,425 was allocated for general overhead and $10,990 for interest on general overhead, insurance, and taxes making a total of $444,525 annual fixed costs. These costs were divided equally between the five plant groups, with each group receiving an assessment of $88,905 (Table 2). It was felt that the most reasonable way of assigning fixed costs is by area rather than plant. Once the physical facility is provided, fixed costs are incurred at essentially the same amount regardless of how the nursery facility is used. On a per-salable-plant basis, there was a considerable difference in fixed costs when they were differentiated by plant group (Table 3). They were: $4.90 for Group I (Taxus), $3.48 for Group II (Juniperus), $3.27 for Group III (Viburnum), $10.87 for Group IV (Acer rubrum), and $7.43 for Group V (Malus) and averaged $4.88 for all groups (Table 3). Fixed costs as a percent of total costs ranged from 30% to 52% and averaged 39% for all groups (Table 3).

Nurserymen having established facilities might well consider fixed costs to be lower than those reported here. This is especially true if they calculate depreciation and repairs on the original value of land improvements, buildings, machinery and equipment and if they place a low value on their own management

input. Good management for planning purposes, however, dictates computing depreciation and repairs on replacement value rather than on original cost. It also dictates placing a value on managerial time that would be comparable to salaries paid in competitive firms.

Total variable costs by plant group were $81,524 for Group I (Taxus), $91,659 for Group II (Juniperus), $103,262 for Group III (Viburnum), $202,260 for Group IV (Acer rubrum), and $206,687 for Group V (Malus). Total for all groups was $685,392 (Table 2). On a per-salable-plant basis variable costs were $4.49 for Group I, $3.61 for Group II, $3.80 for Group III, $24.74 for Group IV, $17.30 for Group V and averaged $7.55 for all groups (Table 3). Variable costs ranged from 48% to 70% of total cost and averaged 61% for all groups.

Total annual costs are the summation of fixed and variable costs. They were $170,429 for Group I (Taxus), $180,564 for Group II (Juniperus), $192,167 for Group III (Viburum), $291,165 for Group IV (Acer rubrum), and $295,592 for Group V (Malus). They totaled $1,129,917 for all groups (Table 2). On a per-salable-plant basis total costs were $9.39 for Group I, $7.09 for Group II, $7.07 for Group III, $35.61 for Group IV, and $24.73 for Group V and averaged $12.43 for all groups (Table 3).

SUMMARY

Total costs per salable plant differentiated by species ranged from $7.07 to $35.61 and averaged $12.43 for all species. Fixed costs per salable plant ranged from $3.27 to $10.87 and averaged $4.88. Fixed costs as a percentage of total costs ranged from 30% to 52% and averaged 39% for all species. Variable costs per salable plant showed substantial differences between plant species. They ranged from $3.61 to $24.74 and averaged $7.55 for all species. Variable costs as a percentage of total costs ranged from 48% to 70% and averaged 61% for all species.

LITERATURE CITED

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TABLE 1.--Plant Densities and losses for Field Production of Nursery Plants, Ohio, 1985.

Group	Description	Size of Salable Plant	Years in Rotation	Spacing Between Rows	Spacing In Rows	Sq. Ft. Per Plant*	Plants Per Acre	Est. Percent Loss**
I	Slow Growing Evergreens - Taxus	18-24"	7	44"	28"	10.2	4,272	15
II	Fast Growing Evergreens - Juniperus	18-24"	5	44"	28"	10.2	4,272	15
III	Deciduous Shrubs - Viburnum	3-4'	4	48"	30"	11.9	3,652	15
IV	Shade Tree - Acer Rubrum	2" dia.	5	96"	42"	33.6	1,298	10
V	Ornamental Tree - Malus	5-6'(1 1/2")	4	96"	36"	28.7	1,518	10

*Sq. ft. per plant includes necessary perimeter roads.

**Assume 1/2 of loss between first and second year and remainder in last year of production. Losses in the last year of production would be left in the field.

TABLE 2.--Summary of Fixed, Variable and Total Costs (Dollars) of Operating a 200 Acre* Field Nursery, Ohio, 1985

Item	Group I (Taxus)	Group II (Juniperus)	Group III (Viburnum)	Group IV (Acer rubrum)	Group V (Malus)	Total
Fixed Cost						
Land and improvements	21,716	21,716	21,716	21,716	21,716	108,578**
Buildings	6,811	6,811	6,811	6,811	6,811	34,055**
Machinery and equipment	25,495	25,495	25,495	25,495	25,495	127,477**
General overhead	32,685	32,685	32,685	32,685	32,685	163,425**
Interest on general overhead, insurance, and taxes	2,198	2,198	2,198	2,198	2,198	10,990**
Subtotal	88,905	88,905	88,905	88,905	88,905	444,525**
Variable Costs						
Propagation	3,560	2,713	2,814	***	***	9,087
Materials	17,070	19,561	20,875	113,506	107,815	278,827
Machinery and equipment	11,739	12,039	14,138	24,747	29,945	92,608
Labor	44,540	52,158	59,590	52,558	57,228	266,074
Interest on operating capital	4,615	5,188	5,845	11,449	11,699	38,796
Subtotal	81,524	91,659	103,262	202,260	206,687	685,392
TOTAL	170,429	180,564	192,167	291,165	295,592	1,129,917**
Salable Plants per Year	18,156	25,418	27,162	8,177	11,954	90,867
Annual Cost per Salable Plant	9.39	7.10	7.07	35.61	24.73	12.43

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.
**Individual figures do not always add to the total due to rounding.
***Tree liners were purchased rather than prapogated. Liner costs were included under materials.

TABLE 3.--Summary of Fixed, Variable, and Total Costs (Dollars) per Salable Plant of Operating a 200 Acre* Field Nursery, Ohio, 1985.

Item	Group I (Taxus)		Group II (Juniperus)		Group III (Viburnum)		Group IV (Acer rubrum)		Group V (Malus)		Average	
	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items												
Land and Improvements	1.20	(13)	.85	(12)	.80	(11)	2.66	(7)	1.82	(7)	1.19	(10)
Buildings	.38	(4)	.27	(4)	.25	(4)	.83	(2)	.57	(2)	.37	(3)
Machinery and Equipment	1.40	(15)	1.00	(14)	.94	(13)	3.11	(9)	2.13	(9)	1.40	(11)
General Overhead	1.80	(19)	1.28	(18)	1.20	(17)	4.00	(11)	2.73	(11)	1.80	(14)
Interest on General Overhead, Insurance, and Taxes	.12	(1)	.08	(1)	.08	(1)	.27	(1)	.18	(1)	.12	(1)
Subtotal	4.90	(52)	3.48	(49)	3.27	(46)	10.87	(30)	7.43	(30)	4.88	(39)
Variable Cost Items												
Propagation	.20	(2)	.11	(1)	.10	(1)	**		**		.10	(1)
Materials	.94	(10)	.77	(11)	.77	(11)	13.88	(39)	9.02	(37)	3.07	(25)
Machinery and Equipment	.65	(7)	.47	(7)	.52	(8)	3.03	(9)	2.51	(10)	1.02	(8)
Labor	2.45	(26)	2.05	(29)	2.19	(31)	6.43	(18)	4.79	(19)	2.93	(24)
Interest on Operating Capital	.25	(3)	.21	(3)	.22	(3)	1.40	(4)	.98	(4)	.43	(3)
Subtotal	4.49	(48)	3.61	(51)	3.80	(54)	24.74	(70)	17.30	(70)	7.55	(61)
Total Costs per Salable Plant	9.39	(100)	7.09	(100)	7.07	(100)	35.61	(100)	24.73	(100)	12.43	(100)

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.
**Tree liners were purchased rather than propagated. Liner costs were included under materials.